Calculus Warm Up #4-5

The rate at which people enter an auditorium for a rock concert is modeled by the function R,

$R(t)= 1380t^2 - 675t^3$, for $0 \leq t \leq 2$ hours.

No one is in the auditorium at time t = 0. Doors close and concert begins at time t = 2.

The total wait time for all the people in the auditorium is found by adding the time each person waits, starting a the the the person enters the auditorium and ending when the concert begins. The function w models the total wait time for all the people who enter before time t.

$w'(t) = (2 - t)R(t)$

Find: $w(2) - w(1)$, the total wait time for those who enter after time t = 1.

Staple and turn in:

<u>Week 4 Classwork</u>

Warm up on top

Purple FR 2002, # 1-3

Blue FR -B 2002, # 6

Today: 10.6 The Ratio Test

Group Quiz on 10.1 - 10.4

Check answers on MC practice

Start HW

10.6 The Ratio Test

A test for absolute convergence for $\sum a_n$

1) Absolute convergence if $\lim_{n\to\infty} \left|\frac{a_{n+1}}{a_n}\right| < 1$

2) Diverges if $\lim_{n\to\infty} \left|\frac{a_{n+1}}{a_n}\right| > 1$

3) Inconclusive if $\lim_{n\to\infty} \left|\frac{a_{n+1}}{a_n}\right| = 1$

Ex: $\displaystyle\sum_{n=0}^{\infty} \frac{3^n}{5^n+1}$

Ratio Test

$$\lim_{n\to\infty}\left(\left(\frac{3^{n+1}}{5^{n+1}+1}\right)\div\left(\frac{3^n}{5^n+1}\right)\right)$$

$$=\lim_{n\to\infty}\left(\frac{3^{n+1}}{5^{n+1}+1}\cdot\frac{5^n+1}{3^n}\right)$$

$$=\lim_{n\to\infty}\frac{3(5^n+1)}{5^{n+1}+1}\cdot\frac{\frac{1}{5^n}}{\frac{1}{5^n}}$$

$$=3\lim_{n\to\infty}\left(\frac{1+\frac{1}{5^n}}{5+\frac{1}{5^n}}\right)$$

$$=\frac{3}{5}<1, \therefore \text{ Series Converges.}$$

You try:

$\displaystyle\sum_{n=0}^{\infty}\frac{n^2\cdot 2^{n+1}}{3^n}$

Ratio Test

$$\lim_{n\to\infty}\left(\frac{(n+1)^2\,2^{n+2}}{3^{n+1}}\cdot\frac{3^n}{n^2\cdot 2^{n+1}}\right)$$

$$=\lim_{n\to\infty}\frac{2(n+1)^2}{3n^2}$$

$$=\frac{2}{3}<1$$

$$\therefore \sum_{n=0}^{\infty}\frac{n^2\cdot 2^{n+1}}{3^n}$$

converges

last one:

$$\sum_{n=1}^{\infty} \frac{(-1)^n \sqrt{n}}{n+1}$$

Ratio Test $\lim_{n\to\infty}\left|\frac{a_{n+1}}{a_n}\right|$

$$a_{n+1} = \frac{\sqrt{n+1}}{(n+1)+1}$$

$$\lim_{n\to\infty}\left(\frac{\sqrt{n+1}}{(n+2)}\cdot\frac{n+1}{\sqrt{n}}\right)$$

$$= \lim_{n\to\infty}\sqrt{\frac{n+1}{n}} \cdot \lim_{n\to\infty}\frac{n+1}{n+2}\cdot\frac{\frac{1}{n}}{\frac{1}{n}}$$

$$= \lim_{n\to\infty}\sqrt{1+\frac{1}{n}} \cdot \lim_{n\to\infty}\frac{1+\frac{1}{n}}{1+\frac{2}{n}}$$

$$= 1\cdot 1$$

$$= 1$$

Ratio Test is inconclusive.

Classwork: BC MC - A Practice test

*Things we still need to learn:

#7, 10, 17, 26 (#13: derivatives of parametric equations. Try it!)

check answers:

1. D	6. B	11. B	16. E	21. E	26. C
2. C	7. B	12. D	17. D	22. A	27. E
3. C	8. D	13. B	18. B	23. B	28. A
4. E	9. A	14. C	19. D	24. D	
5. D	10. D	15. E	20. E	25. E	

HW: p. 604, # 1 - 19 odd

Simplifying $\frac{n!}{(n+1)!} = \frac{n(n-1)(n-2)(n-3)\cdots}{(n+1)(n+1-1)(n+1-2)(n+1-3)\cdots}$

$= \frac{\cancel{n}\cancel{(n-1)}\cancel{(n-2)}\cancel{(n-3)}\cdots}{(n+1)\cancel{(n)}\cancel{(n-1)}\cancel{(n-2)}\cdots}$

$= \frac{1}{n+1}$